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GEOGRAPHIC AREA, ORR, CONTRIBUTION TO SNIE 11-5-59

SOVIET CAPABILITIES IN GUIDED MISSILES AND ASTRONAUTICS

CIA/RR G/I-59-39

(ORR Project 69.1781)

24 June 1959

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23 June 1959

ESTIMATE OF SOVIET GEODETIC AND CARTOGRAPHIC UNCERTAINTIES IN THE POSITIONING OF LAUNCH SITES TOWARD MAJOR TARGET AREAS

Geodesy. The Soviet geodetic system, adopted by the European satellite countries in 1952, now extends across Eurasia to the Pacific Ocean and, very likely, the Bering Strait. It provides control for the topographic mapping of the USSR and can provide the accurate positioning required for ICBM launch sites. First-order horizontal control covers at least two-thirds of the USSR and is programmed for completion, including extension into Siberia, within ten years. Probably the rapidly developing geodetic control of Communist China will also be referenced to the Soviet datum. Through geodetic activity permissible under Soviet mutual aid programs and through the steady acquisition of survey and gravity data from the rest of the world, the Soviets are endeavoring to build their control system into a world geodetic system. They expect that data received from artificial earth satellites will ultimately provide much more accurate relative positioning of the continents than exists today. Current uncertainties of approximately 500 to 1000 feet in the relative positions of principal control points in Eurasia and in United States may by about 1965 be reduced to 100 to 200 feet in the total target error for the ICBM. If launch sites should be located in the Chutkotsk area of the USSR they could be related to Alaskan targets to within 100 to 200 feet if the

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Soviets, as we believe, have made a covert geodetic tie across Bering Strait. The same Chutkotsk launch sites against other continental US targets would involve geodetic positioning uncertainty approximating 400 to 500 feet. The present positioning uncertainty with respect to West European targets to be reached from Soviet launch sites in the Aral Sea area is estimated at 200 to 300 feet. The Soviets are anxious to obtain representative gravity data covering the vast ocean areas of the earth, and are trying to overcome technical difficulties of making gravity observations on moving surface vessels. They also hope to adapt these surface ship gravity meters to use in airplanes to facilitate a direct measurement of the exterior gravity field of the whole earth.

Cartography. On the basis of what is known of Soviet procurement of easily obtainable US maps, it is assumed that the Soviets have maps covering about one-third of the US at scales of one inch to a mile (1:63,360) and 1:50,000 for ICBM use against US targets. It is also assumed that coverage of the entire US at the scale of 1:250,000, a map series now nearing completion, will also become available to them. In this 1:250,000 series, the allowable cartographic error (0.02 inch) in the planimetric representation of features is about 400 feet. In covertly locating US launch pads upon the 1:250,000 map the Soviets would encounter additional reconnaissance uncertainty that would raise this error to about 500 feet. For areas covered by the "inch-to-the-mile" maps this error would be only one-fourth as great as for the 1:250,000 series.

The Soviet topographic map series at 1:100,000 is now completed for the whole of the USSR. The series is under constant revision, however,

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as geodetic control displaces the astro-control formerly used in mapping parts of Siberia. In Soviet map production emphasis has shifted to the larger-scale series at 1:50,000 and 1:25,000. By withholding geodetic data, gravity data, and topographic maps from the West the Soviets have greatly impaired US strategic planning against Soviet ICBM launch sites. Since the Soviets are conscious of the sustained success of their security measures so far, they will surely take utmost precaution against any leakage of launch-site information to the West. From a comparison of the cartographic advantages of the USSR and the US in locating ICBM launch sites, it appears that the Soviets have realized a greater gain through their successful withholding policy than the US has achieved through inadvertent failure to map at large scale those areas of the US that are now considered suitable for launch sites.

Soviet positioning error. If current geodetic intercontinental uncertainties are combined with cartographic error, the Soviet geodetic-cartographic error (Root Mean Square Error) is believed to be 700 to 1100 feet. If the intercontinental error is reduced and no change is made in the cartographic, then the geodetic-cartographic error associated with the large-scale maps (1:25,000 through 1:100,000) would be reduced to about 150 feet, and in the 1:250,000 series to about 550 feet.

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